

CASE REPORT

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Anesthesia management for emergency cesarean section in a patient with takotsubo cardiomyopathy

Sedat Hakimoglu, Onur Koyuncu, Cagla Akkurt, Sumeyra Yesil, Senem Urfali

Mustafa Kemal University Faculty of Medicine, Department of Anesthesiology and Reanimation Hatay, Turkey

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Abstract

Takotsubo cardiomyopathy (TCM) is a clinical entity resembling acute myocardial infarction that develops due to catecholamine discharge and coronary artery spasm following acute stress in postmenopausal women. The most common symptoms are chest pain, syncope and dyspnea. Moreover ST interval and T wave abnormalities are frequently seen on electrocardiogram (ECG). 19-year-old pregnant with TCM underwent for emergency caesarean section (C/S). Ejection fraction was measured 60% in preoperative echocardiography. Anesthesia induction was achieved with 2 mg/kg propofol and 1 mg/kg fentanyl, after rapid serial endotracheal intubation was performed by using 1.2 mg/kg rocuronium bromide. Anesthesia was maintained with sevoflurane. Residual block was reversed by 4 mg/kg dose of sugammadex and there was no complication in the perioperative period. In anesthesia management of patients with TCM, minimization of situations that caused an increase in catecholamine, if possible follow-up with advanced cardiac monitoring and it should be postoperative intensive care unit (ICU) preparation.

Keywords: Anesthesia, caesarean, takotsubo

Introduction

Takotsubo cardiomyopathy (TCM) is classified in cardiomyopathies by American Heart Association (AHA). Although nomenclature was different in the literature before 1990, the term TCM was first defined by Sato et al. [1] from Japan. The disease was named as TCM due to its similarity to a jar used for fishing octopus in Japan. In the literature, it is also termed as “Stress cardiomyopathy”, “Transient left ventricular apical ballooning syndrome”, “Ampulla cardiomyopathy” or “Broken heart syndrome”.

The TCM accounts for 1-3% of suspected acute coronary syndromes, which is characterized by reversible left ventricular failure. It is often seen in postmenopausal women [2]. It usually develops due to catecholamine discharge and acute coronary spasm following acute stress. There are rare variants such as Reverse Takotsubo, right ventricular Takotsubo or global hypokinesia. The most common symptoms are chest pain, ST elevation and negative T wave on ECG, and elevated cardiac enzymes. It should be considered in the etiology of sudden cardiac death. In larger series, in-hospital mortality rate was reported as 3%.

Although anesthesia induction may increase incidence of complication, there are limited number of cases about anesthetic management in the literature. Here, we aimed to present anesthetic approach in a 19-year old pregnant patient with TCM who underwent urgent cesarean section.

Case

Written informed consent was obtained from the patient. A 19-year old pregnant woman (gestational age: 37 weeks) with TCM was admitted to Obstetrics & Gynecology clinic with indication for emergent cesarean section. In preoperative assessment, the patient admitted to the emergency department with loss of consciousness one year ago and diagnosed as TCM according to Mayo Clinic criteria (Table 1) [3].

The patient was discharged after recovery of ventricular function with ejection fraction (EF) of 60%. Before C/S section, EF fraction was detected as 60% in preoperative echocardiography. The patient was scheduled for general anesthesia with ASA IIE. No premedication was given to the patient. Routine monitoring with additional invasive arterial monitorization was maintained throughout surgery. Following pre-oxygenation (4 maximum inspiration with 100% O₂), intravenous line was inserted by using 20 G cannula and Ringer's lactate solution started. The

*Corresponding Author: Sedat Hakimoglu, Mustafa Kemal University Faculty of Medicine, Department of Anesthesiology and Reanimation Hatay, Turkey
E-mail: sedathakimoglu@gmail.com

ephedrine and intravenous adrenaline infusion were prepared for potential hypotension during induction and operation. Moreover, preparation for transthoracic echocardiography was made to detect cardiac dysfunction instantly. Anesthesia was induced by propofol titration (total dose: 2 mg/kg) until loss of verbal response and 1mcg/kg fentanyl. Neuromuscular blockade was achieved by rocuronium bromide (1.2 mg/kg); then, rapid sequence intubation was performed by cricoid compression and operation was started. Anesthesia was maintained by 50%/50% oxygen-air mixture and sevoflurane (MAC: 0.8-1.0). After delivery and clipping of umbilical cord, intravenous fentanyl in divided doses (total 1 mcg/kg) was given. No arrhythmia was observed during intra-operative period. For postoperative analgesia, tramadol HCl (1 mg/kg; iv) and paracetamol (1 gr; iv) was given 20 minutes before end of surgery. Residual block was reversed with sugammadex (4 mg/kg) and the patient was extubated after intravenous lidocaine administration (40 mg). Vital signs were stable at postoperative period and no complication was observed in postoperative recovery unit. Thus, patient was transferred to obstetrics clinic.

Table 1. The results of electrocardiogram (ECG), echocardiography (ECHO) and coronary angiography (CAG) one year before surgery were as follows

The results of patient with TCM one year before surgery	
CAG	• A fistula from trunk of left anterior descending (LAD) artery to pulmonary artery
	• Normal circumflex artery
	• Normal right coronary artery
	• Left ventriculography: Apex was akinetic with aneurysm and basal segments were hyperkinetic
ECHO	• Ejection fraction: 20%
	• All segments akinetic except for basal segments
	• Advanced left ventricular dysfunction
ECG	• Sinus rhythm
	• Heart rate: 75 beats/minute
	• Negative T wave in V1-6 leads
	• Prolonged QT interval

Table 2. Mayo Clinic diagnostic criteria for Takotsubo cardiomyopathy

Mayo Clinic diagnostic criteria
1. Transient hypokinesis or akinesis at apical and mid-portion of left ventricle as demonstrated by echocardiography or ventriculography, which could not be explained by anatomic projection of a single artery,
2. No relevant coronary artery stenosis (>50%) as demonstrated by coronary angiography,
3. New-onset ST segment elevation or T wave changes,
4. No head trauma, intracranial hemorrhage, pheochromocytoma, myocarditis or hypertrophic cardiomyopathy.

Discussion

The clinicians have long recognized relationship between stress and acute cardiovascular events. In 1991, Dote et al. [4], reported that acute onset akinesis of apical and mid-portion of left ventricle without accompanying epicardial coronary artery stenosis. In these patients, ECG may be normal or non-specific T-wave abnormality and significant ST elevation in precordial and extremity leads. The most common ECG sign (50-60%) was mild elevation in ST

segment. The symptoms are typically transient and abnormal apical wall movements are recovered within days or weeks. Despite cardiac signs, prognosis is good and in-hospital mortality ranges from 0 to 8%. It has been reported that the symptoms are more frequently seen at summer, monday and morning hours, which is proposed to be due to catecholamine discharge or excessive catecholamine release because of stress.

Differential diagnosis should include cardiovascular disorder associated to high morbidity and mortality such as acute myocardial infarction, aortic dissection or cardiac tamponade. Coronary angiography is an effective method in the differential diagnosis of these disorders. On angiography, apical ballooning in left ventricle and normal coronary arteries has diagnostic value for TCM. Mayo Clinic criteria (Table 2) are widely used in the diagnosis of TCM and it has been suggested that all criteria should be met for diagnosis [5].

Besides cardiac disorders, disease causing catecholamine discharge such as pheochromocytoma as well as head injury and stroke should be excluded for definitive diagnosis. Psychiatric disorders, neuroleptic therapy, disorders of sympathetic nervous system, decreased heart rate variability, alteration in platelet functions, increased pro-inflammatory process, radiotherapy and chemotherapy in cancer patients, pain crisis and Alzheimer’s disease can lead TCM.

There are several publications indicating an apparent relationship between subarachnoid bleeding and TCM. In addition, it was reported that it is associated to pulmonary edema, prolonged intubation and cerebral vasospasm, all which can be complication of anesthesia. The association of TCM with these complications encourages to perform early extubation and to use sugammadex for eventless extubation process as possible in these patients. Otherwise, prolonged intubation can cause holding breath while intubated, resulting in fatal neurological complications. In addition, rare but fatal complications such as cardiac rupture, ventricular arrhythmias or apical thrombus can develop, requiring ICU care. Thus, we reserved an ICU bed for our patient before surgery. We were also aware of need for close monitorization with echocardiography and that these conditions can be treated with intra-aortic balloon pump, anti-thrombotic agents and beta blockers; thus, we took measures for required interventions. Angiotensin converting enzyme inhibitors, angiotensin II type 1 receptor blockers, specific aldosterone antagonist (spironolactone) and anxiolytic agents comprise other pharmacological options. Treatment with opiates can be preferred in case of pain.

In the literature, experiences about anesthesia management are rather limited. In this case, we discussed effects of general anesthesia in a patient with Takostubo syndrome who underwent emergent cesarean section. In our case, no transient left ventricular failure was detected after anesthesia induction. In patients with TCM, one should maintain sinus rhythm and to avoid tachycardia and profound bradycardia, establishing an anesthesia plan according to clinical presentation of the patient. In available literature, there is no study or case series indicating superiority of general anesthesia over neuraxial anesthesia. When selecting anesthesia modality in our case, we decided to perform general anesthesia despite routine practice of regional anesthesia in our clinic, as spinal anesthesia may involve cardioaccelerator fibers due to increased

intra-abdominal pressure in pregnant women, which, in turn, enhance effects of hypokinetic regions that occur simultaneously, resulting in severe complications. To minimize cardiodepressant effect of intravenous propofol, we preferred slow infusion with up-titration. In a case series including 3 patients with unrecognized TCM (2 patients underwent general anesthesia and one patient underwent epidural anesthesia) before surgery, Küçükdurmaz Z et al. [6], reported one death in one of the patients underwent general anesthesia. In a patient with TCM who underwent transurethral resection-bladder tumor (TUR-BT), it was reported that the patient developed acute dyspnea, tachycardia and ST segment elevation at postoperative hour one with mid-apical dyskinesia and that the patient was diagnosed as Takotsubo cardiomyopathy [7].

Majority of patients present with symptoms of acute coronary syndrome and sudden death can be seen in 3% of patients. Vasopressor can be required to maintain normal blood pressure while monitoring myocardial functions. In addition, increased preload can cause pulmonary edema in patients with left ventricular failure; thus, it should be optimized in individually. In contrary to patients with coronary artery disease, increasing diastolic blood pressure will not improve myocardial performance. It was reported that endotracheal intubation was performed with guidance of ventricular functions as monitored by echocardiography in a patient with TCM underwent surgery for clipping intracranial aneurysm. Authors reported that aneurysm clipping was performed uneventfully by monitoring intraoperative cardiac status, volume and hemodynamic responses via transthoracic and transesophageal echocardiography. In addition, noradrenalin infusion (0.05 mcg/kg/min) was given as vasopressor agent during hypotension episodes. Levosimendan is also an effective option for initial treatment of TCM patients with acute decompensated heart failure, which has calcium sensitizer and potassium canal opening effect. Although vasopressor agent was prepared in our case, we did not use during perioperative process. Opiates, beta blockers and dexmedetomidine (central-action alpha-2 agonist) can be preferred to suppress stress response although benefit has not been proven in TCM cases. Elective surgeries should be performed in clinics where echocardiography and intra-aortic balloon pump are available. In our clinic, we performed surgery under general anesthesia without hemodynamic deterioration in this case.

As a result there is no established anesthetic-surgical strategy or guideline in order to prevent recurrence in TCM patients requiring

surgery. The lowest suspicion level and close monitorization as possible seem to be safest option for early diagnosis of potential complications during perioperative period. Although there is no clear suggestion for anesthesia modality, the aim should be to maintain optimal cardiac conditions and to avoid tachycardia, bradycardia and changes in preload. If general anesthesia is preferred, one should minimize conditions that may cause increased catecholamine release during intubation and extubation and intensive care unit should be available for postoperative care.

Competing interests

The authors declare that they have no competing interest.

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Ethical approval

This study was approved by the local ethics committee and performed in accordance with the ethical standards of the Helsinki Declaration.

Sedat Hakimoglu ORCID: 0000-0002-1556-7996

Onur Koyuncu ORCID: 0000-0002-0364-6638

Çagla Akkurt ORCID: 0000-0001-9937-6855

Sumeyra Yesil ORCID: 0000-0002-7029-5946

Senem Urfali ORCID: 0000-0003-4500-2408

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